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CLASSIFICATION OF NATURAL SOUNDS IN THE UNDERWATER AMBIENT*

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ABSTRACT

The identification of sounds heard in the water is very difficult. When the problem is complicated by the addition of an ice cover over the water the difficulties are often magnified and we must be very careful of attaching particular identifications to the sounds heard without good supporting evidence. The investigation of the source of often-heard 20-cps signals is cited as an example of problems encountered and how a solution and eventual identification was made.

INTRODUCTION

The definite attribution of a particular sound to a particular kind of animal is much more difficult underwater than in air. Bird watchers, for example, have little trouble, by comparison. If you look down the bearing of a sound and see a bird with its mouth open, you are well on the way to the answer. But through water you can't begin to see as far as you can hear, and besides, aquatic sound-makers do not have to open their mouths to talk. It takes long experience at sea, with accumulated circumstantial evidence, to arrive at the right answer. A most important qualification is a strong sense of doubt and suspicion of one's own and others' hypotheses. Good luck is also useful.

ANIMALS UNDER THE ICE

For instance, we offer a chapter out of the still unfinished investigation of the strong and widespread 20-cycle signals that attracted the attention of underwater listeners soon after 1950. All sorts of suggestions were made to account for them. They were blamed on men, machines, microseisms, and other meteorological and geological activities, fish, whales, and even invertebrate animals, and probably other things I have forgotten or never heard of. After many years of sea-going (and some shore-based) listening, testing out many suspects, including all available kinds of whales, we finally realized that these signals and finback whales seemed consistently to go together. Our doubts were ultimately overcome when we went to a Canadian listening station where sound propagation was extremely poor, with very short ranges, and where we were told that finback whales were not present at the time the signals were heard. A combination of days of listening with protracted airplane surveillance at last rewarded us with finding finback whales at the hydrophone site at the same time the signals were heard. When the whales moved off, the signals faded; when the whales moved back, the signals came in again. And so we finally were convinced.

Now, the polar regions, and especially the Arctic, present special difficulties. For a man sitting in a hut on an ice cake, let alone an ice island, there is the difficulty that the underwater sound sources are practically never otherwise detected (as by sighting). Moreover, we know

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so nearly nothing (acoustically or even otherwise) about what animals are available in the region. Little else can be done in the winter darkness, but in summer daylight aerial reconnaissance would be an important effort.

Such sounds as have been recorded out in the ice are sometimes suggestive of animal sounds known from other and even adjoining waters, but upon analysis many do not qualify. Others seem surely to be animals, but of unrecognized kinds, such as certain recordings made in the Arctic by Mr. Robert H. Mellen (but there were no supporting sightings).

SOUNDS MADE BY ICE

There is however, in the polar oceans a source of manifold and nearly unlimited sorts of sound—ice. We are only beginning to comprehend the wide range of sounds that can be made by this substance. In winter, when the high latitude seas are frozen solid or nearly so, there is relatively little noise, and that little is largely of the strong impulsive kind described at this symposium by Mr. Allen Milne. But when the spring break-up comes, and pieces of ice of widely varying extent, thickness, and temperature begin to grind upon each other under the influence of winds and currents, there seems to be scarcely any limit to the range of sounds produced. They may be almost anywhere in our acoustic spectrum, with or seemingly without rhythm; some, as has been said, may resemble known animal calls, while others may not. For example, among many others more difficult to describe, we have heard sounds like the screech of streetcars rounding sharp turns. Good samples of the wild medley of ice sounds are recordings made by the U.S. Naval Electronics Laboratory in the shallow waters of Bering Strait, and others by us in the deeper sea at the edge of the Antarctic Barrier near Ross Island. In these instances we feel that animal contributions are far outweighed by the overpowering ice sounds.

It is hoped that the many recordings already made in the ice by naval and civilian investigators may be brought together for study, and that they may be added to. Useful supporting data, besides geographic position and season, would include air and sea temperatures, current and wind measurements, amount of ice cover, size, thickness, and temperature of the pieces of ice, animals present, as well as pertinent details of the listening and recording system. Thus we may ultimately have a better and more useful understanding of the ambient noise background of the polar seas. But we will not be helped very much by recordings contaminated by generators, ship and camp machinery, and other artificial contributions to the ambient. These man-made sounds can be studied much more cheaply at home. The importance of clean natural broadband records cannot be exaggerated.

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